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it still has most of the advantages of novelty to recommend it, and besides that of conveying information on a matter which with justice, is very interesting to many, who are either professors, or amateurs of architecture; and which ought to be so to most others also, as the greatest part of mankind are more or less concerned in the proper construction, and extended preservation of houses, and of those other works likewise, to which cements impervious to water can be applied.

Had the ingenious gentleman who wrote this paper, been now alive, it would have given him much pleasure, to see the hint, which he has thrown out, relative to the application of those cements, to the ornamental parts of architecture, realized; several specimens of this kind are now to be seen in London, which endure the weather extremely well; of which the new Theatre at Covent Garden is the most remarkable, for the ingenuity exercised in the application of the cement to the high projections of the Doric cornice, as well as for its great beauty and extent.

The directions given in this paper, for the great thickness of the coat of puzzolana on the roof, appear more necessary for the hot climate where it was used, than for this.—Thick roofs keep a house cool in Summer, and warm in cold weather; but in our temperate climate, a thinner roof will do sufficiently well, and be cheaper, both from not requiring so much cement, and from timber of less scantling being necessary for its support, on account of its greater lightness.

But where strength and durability are preferred to lightness of timbering, it might be the cheapest method to cover the rafters with a layer of bricks cemented together with the puzzolana, with one or two coats of it, of about an inch thick, layed over all.

In addition to the advantage of flat roofs, mentioned in page 135, vol. 3, for which roofs puzzolana is peculiarly adapted, it should be noticed that they would afford great facility for escape in case of accidents by

fire, if the neighbouring houses were also furnished with them, as in this case the passage from the top of one house to another would be attended with little difficulty or danger. The same circumstance would also much assist efforts for extinguishing fires, as well as escaping from them; for on the neighbouring flat roofs, fire engines might be worked with as much ease as on the ground, and in many cases with much more efficacy.

Flat roofs likewise would afford the convenience of permitting chimneys to be swept, with very little trouble in the simplest manner, without having recourse to the inhuman, and in many instances fatal practice of sending unfortunate children up the flues; a practice, with which we can scarcely find any parallel in point of unnecessary cruelty to tender and helpless years, among the most savage nations; and to which nothing but tyrant custom could at all reconcile us, so as to contemplate it with the usual indifference.

On the art of Printing with Stone, and on the progress which this art has made in Germany. by M. Marcel de Serres. Annales de Chemie.

The art of printing with stone was originally discovered in Germany, and has since spread into England, Italy, and lately into France. Alois Senefelter, a native of Prague in Bohemia, is the inventor of this new method of printing, which is known in Germany by the name of *chemische druckery*, i. e. chemical printing. It is now nine years since he obtained from the then elector of Bavaria, an exclusive privilege to exercise it for 13 years, but Senefelter soon after ceded this privilege to his brothers; some time afterwards he ceded this privilege to M. Andre of Offenback, who has since carried on the art in England. In 1802 he went to Vienna to solicit a fresh privilege, which he obtained in 1803, from the emperor of Austria for the term of 30 years. He disposed of this privilege to Messrs. Steiner and Krasnitski, and returned to Bavaria, where, having arrived at Munich, he opened in partnership with some other persons,

a stone-printing house. Messrs. Steiner and Krasnitski, have kept up the practice of this art at Vienna, being supported in their design by Startl de Luchsenstein, a counsellor of the regency, who warmly interests himself in whatever is useful.

The stone-printing house established at Munich is that where the art has been brought to the greatest perfection; and that at Stutguard appears to be much less important. M. Chauvron is the first who obtained in France a brevet of invention to print, or engrave with stone, and M. Guyot Desmarest has only engaged in it since his time.

The processes, which are used in printing with stone, are very simple; at Vienna they use three different methods of printing with stone; but they most commonly employ that, which is called the method in relief; which is used chiefly for printing music.

The second method, that is employed, is the hollow method, and this is preferred for engravings.

The third is the flat method, or that which is neither hollow nor in relief: this is very useful for the imitation of drawings, and particularly of those drawings, which are to be made like those that have been drawn with chalk.

To print, or engrave according to this process, a slab of indurated marle, or any other calcareous stone is used, provided the stone can be easily cut, and takes a good polish. These stones may thus be compared to the copper plates, or wooden blocks, for which they are indeed substituted. The size of the stone, as may be easily judged, should be in proportion to that of the work, which it is meant to be engraved on them. It ought to be from two inches to two inches and an half thick; it is proper to observe however that this thickness is not absolutely necessary, but it is very convenient to make use of a stone of this thickness, in order that it may last longer. A good polish ought to be given to the stone, and this polish ought to be in some degree granular, or rough; it also appears that a small grain, although the stone is in

some degree porous, is a desirable advantage. At Vienna slabs of indurated marle brought from Bavaria are used; this marle is quarried at Sollenhoffen, near Sapeinheim. It is very fortunate that as the interesting art of printing with stone has been established in France, stones that possess all the necessary qualities have been found near Paris.

When the stone is dried, and well polished, the next operation is to draw the design, notes, or letters that are intended to be printed upon it with a pencil. The design traced in this manner is not sufficiently apparent; and in order to render it more so, a particular kind of ink is retraced over the mark of the pencil. This ink is considered at Vienna as a great secret; it appears to be formed of a solution of gum lac in potash, which is afterwards coloured with lamp black produced from burning wax. When the letters or notes are marked with the ink just now described, the ink is left to dry, most commonly for about the space of two hours; but nothing positive can be said on this point, as the time required to dry the ink depends so much upon the temperature and humidity of the air; but the most ignorant workman will be able to determine when the ink is dry. It must be again observed that the ink whose composition has been just described, is coloured with lamp-black made from burning wax; as this black has been found most convenient for this kind of printing.

When the letters or musical notes impregnated with this black are dry, nitric acid is passed over them more or less diluted, according to the relief or hollow which is desired to be formed on the stone; and the acid attacking all parts of the stone but those which have been impregnated with the resinous ink, only the notes or drawing remain untouched.

The slab of marle is then washed with water to render it clean; and a printer's ball is charged with ink of the same kind used in common printing. It is only the letters or notes that take the ink from the printer's ball so that they become properly colour-

ed. After this a sheet of paper being put in a frame, the frame is lowered, and a brass cylinder is passed over the paper, or a copperplate-press is used. At each proof it is necessary, as in all other kinds of printing to wash the plate with water.

When the number of copies, intended to be printed are finished, and no farther use is designed to be made of the work, the stone is polished again, and thus the same slab will serve for thirty or forty different works. The method called the hollow method, in German *kreide manier*, does not differ greatly from the method in relief, except that the nitric acid is made to act stronger upon the stone, so that the letters are more relieved, and the stone itself much hollower. This method is principally used by the engravers; and it has this advantage over the other methods, that it remedies that equality of tone, which printing from stone produces in the works. It is easy to be conceived that the highest parts will take up less of the colour, and the hollow parts more, so that the print thus managed has a less monotonous effect than is usual, to which defect this method of engraving has always been liable. Besides this the hollow method requires much stronger rollers, and particularly that they should be heavier. As therefore more expense is necessary in this method, it has been totally left off; nevertheless it ought to be preferred for those engravings, which require some effect and much neatness. Nitric acid almost pure, is employed in this method, and indeed pure nitric acid was always employed when printing from stone was first used; its dearness however led to its being weakened with water, and now it is diluted, according to the effect desired to be obtained.

In the method which is called in relief, nitric acid is used diluted with one half of water. This method is called in German *erhabene*, and is principally employed to print music: as scarcely any thing but music is engraved at Vienna, it is almost the only method they use. To print in this manner, the pressing rollers that

are used are not so heavy as those employed in the hollow method.

The third method called the flat manner, and in German *erflach*, is particularly advantageous for engravings imitative of chalk drawings. Less nitric acid is used in this method, but great care must be taken that the stone which is prepared for this purpose is quite flat. Although the letters rise very little, they do nevertheless stand up above the surface; but it is less sensible than in the other methods, and can scarcely be discovered but by the touch.

The kinds of work that are engraved in stone are the following.

1. Imitations of wood cuts,
2. Imitations of the dot manner,
3. Drawings,
4. Musical works,
5. All kinds of writing,
6. Geographical maps,
7. Engravings in mezzotinto.

The advantages which result from the manner of printing or engraving, that has been described above, are that this printing has a peculiar character, which cannot be imitated by the other methods of printing, and that it can easily imitate any of the former. But its greatest advantage is the quickness with which it may be performed in proportion to the other kinds of printing.

A design which an artist could not finish upon copper in the space of five or six days, may be engraved upon stone in one or two days. While the copper-plate printer draws off six or seven hundred impressions, the printer from stone can take off in the same space of time 2000 impressions. An engraved copperplate will seldom yield 1000 impressions; but the stone slab will yield several thousand, and the last will be altogether as good as the first. It has been tried in the stone-printing office at Vienna to take off 30,000 impressions of the same design; and even then the last impression was nearly as handsome as the first. They have even carried the number of copies to a greater extent in printing bank notes.

The most industrious and most skilful engraver of music can hardly engrave four pages of music on pewter in a day, while the engraver on stone may cu-

grave twice as many in the same time. Every kind of work which artists engrave upon copper or pewter, and which the printer executes with moveable types may also be performed by using stone.

It would take up too much time to detail all the expenses of this method of printing; but experience shows that printing upon stone may be performed with a saving of one third of the expense, in the comparison of the printing with copper or pewter.

After having thus shown the advantages resulting from this method of printing on stone, it is but right to point out its disadvantages. The principal of these disadvantages is the difficulty that occurs, when it is attempted to give either to the characters of the impression, or to the strokes of the engraving, that diversity of tone, which renders these two kinds of works valuable in the eyes of those, who look for beauty in every thing. Thus for example, the most beautiful engravings that printing on stone has hitherto produced, are certainly those that have been executed at Munich, after the famous drawings, which Albert Durer, by a very common caprice among painters, had traced on a book of prayers.* These engravings are performed with much spirit: the strokes are frequently very fine, but it is too equal, so that the engraving is rather grey and uniform. It is principally by comparing these engravings with those of the same subject which other masters have executed in etching with aquafortis, that the difference will be most perfectly perceived. In the latter it is soon observed that the engraving tool has been directed so as to give the necessary force to the line; thus rendering it sometimes strong, and sometimes fine, as it would be in a drawing, and that still there is no stiffness in it. But in the engravings upon stone that have been hitherto

published, neither this freedom can be perceived, nor the strength which adds so much to the relief of the engravings performed with aquafortis.

The same inconvenience is also to be found in the music printed in this manner, and the equal tint that is spread over it also renders the music less legible. It must not, however, be hastily concluded from this, that the new art is not important, but only that some method of avoiding the inconveniences, which appear to arise alone from the processes now used, should be sought after. If these methods should be discovered, which may be expected from a more extended experience in the art, particularly in the mode of applying the acid, and of drawing upon the stone, which are in fact the two most essential points to bring to perfection, this method of printing will unite an economy of time, to that of expense. The great number of impressions that can be obtained by this method, is not one of its least advantages. And, lastly, it is certain, that the discovery of printing from stone, is an important discovery for the arts, because it is a new one, and offers several real advantages.

It now only remains to mention the differences that appear to exist in the printing houses on this plan, which are established in different cities. It seems that at Milan they pour upon the stone a little nitric acid diluted with water as at Vienna; but it is asserted, that they cannot take off more than 500 impressions; a circumstance which probably depends on the nature of the stone, that they use there, and which is brought from Verona.

It seems that Chauvron, the first who established a printing house of this kind at Paris, having first traced the lines upon the stone with resinous ink, contents himself with moistening the stone with water. He then wipes off the water lightly, which soon leaves the resinous lines, and leaves them dry. On applying after this printer's ink by means of the common balls, the ink does not adhere to those parts of the stone, which remain impregnated with moisture, and of course

* Albrecht Dürers, *Christliche mythologische handzeichnungen*, Strunxer, München 1868. Different coloured inks, have also been used in printing the designs; black and red ink, have been employed, as also violet and green ink.

it is only the resinous lines, which leave any impression. Chauvron is said to have printed a considerable quantity of music in this manner.

It ought to be observed, that in those printing-houses, where they do not make use of nitric acid, they always produce a very inferior kind of work, and can only take off a very small number of impressions. It therefore appears that the use of nitric acid cannot be too strongly recommended; and after what has been already said, the reason is evident.

Account of the Spartum or Broom Plant, and of various uses which are made of it, from Beckman's history of Inventions, vol. 2, p. 287.

Accounts having been given in vol. 3, p. 457, and in this volume, p. 134, of methods of preparing flax from the broom plant, the following extract from Beckman is presented to our readers on account of the valuable information which it contains on the subject, as forming a good sequel to what has already appeared.

“The antients, and particularly the Greeks, understood by *spartum* a shrub, the slender branches of which were woven into baskets of various kinds, and which produced young shoots that could be prepared and manufactured in the same manner as hemp; and this plant, as has been remarked by the old botanists, is the *spartum junceum*, or Spanish broom, which grows wild on dry land, that produces nothing else in the Levant, and in the southern parts of Europe. This broom is that described and recommended in *Comment instituti Bonnoniensis*, v. i. p. 349, and v. i. p. 118. The French translator of the papers here alluded to is much mistaken, when he thinks in *Journal economique*, 1785 *Novembre*, that the author speaks of the common broom (*spartum scoparium*) that grows on our moors. Mr. Broussonet, in *memoires d'agriculture, par la societe de Paris* 1785, *trimestre d'automne* p. 127, has also recommended the cultivation of *spart. junceum*, under the name of *genet d'Espagne*, and enumerated the many uses to which it may be applied. The people in lower Languedoc,

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especially in the neighbourhood of Lodeve, make of it table cloths, shirts and other articles of dress. The offal or rind serves as firing. This *spartum* of the Greeks or *spartum junceum* of the botanists, is the species called by Pliny, book 39, chap. 9, *genista*, and which he improperly considers as the Spanish and African *spartum*. The latter is certainly the *stipa tenacissima*, which grows in Spain and Africa, called there at present *sparto* or *esparto*, and which is still prepared and employed, as described by Pliny, b. 19, c. 2. Baskets, mattresses, ship cables, and other strong ropes were made of it; and when this rush was prepared like hemp, it was used for various fine works. Even at present the Spaniards make of it a kind of shoes called *alpergates*, with which they carry on a great trade to the Indies, where they are very useful on the hot, rocky and sandy soil. The best account of this rush may be found in *Clusii histor. plantar. rar.* p. 220: in *Lofling's Reisebeschreibung, Berlin* 1776, 8vo. p. 169; *Osbeck's reise*, p. 18; the *Paris schau-platz der kunste*, and the *encyclopedie methodique des manufactures par Roland de la Platiere* art. *sparte*. Whether the ancients made shoes for their cattle of the *spartum junceum* or the *stipa tenacissima*, I will not venture to determine. It is probable that the former was used by the Greeks, and the latter by the Romans; and it is highly worthy of being here remarked, that in modern times a kind of socks for horses were made of a species of *spartum*, as we learn from John Leo, who says; *Quosdam reperius qui sportas certosque funiculos parant, quos Afrani equorum pedibus addere solent: J. Leonis Africa descriptio* Antverpiæ, 1556, 8vo. Lib. 3, p. 120.

Account of the South American plant Arracacha, from a description given by Mr. Vargus.

Annals of Botany, No. 2, p. 460.

The plant known in Santafe de Bogota by the name of Arracacha, is one of the most useful of all the vegetables of that part of America. It belongs to the order of *Umbelliferæ*, and in its habits resembles an *Apium*; L L l